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| Eighth Grade Science 2010-2011  Standards Overview | |
| Physical Science | 1. Identify and calculate the direction and magnitude of forces that act on an object, and explain the results in the object’s change of motion  2. There are different forms of energy, and those forms of energy can be changed from one form to another – but total energy is conserved  3. Distinguish between physical and chemical changes, noting that mass is conserved during any change  4. Recognize that waves such as electromagnetic, sound, seismic, and water have common characteristics and unique properties |
| Life Science | 1. Human activities can deliberately or inadvertently alter ecosystems and their resiliency  2. Organisms reproduce and transmit genetic information (genes) to offspring, which influences individuals’ traits in the next generation |
| Earth Science | 1. Weather is a result of complex interactions of Earth's atmosphere, land and water, that are driven by energy from the sun, and can be predicted and described through complex models  2. Earth has a variety of climates defined by average temperature, precipitation, humidity, air pressure, and wind that have changed over time in a particular location  3. The solar system is comprised of various objects that orbit the Sun and are classified based on their characteristics  4. The relative positions and motions of Earth, Moon, and Sun can be used to explain observable effects such as seasons, eclipses, and Moon phases. |

**1st Quarter 8th grade 2010-2011**

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| Concepts and skills students master:   * 1. Identify and calculate the direction and magnitude of forces that act on an object, and explain the results in the object’s change of motion | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Predict and evaluate the movement of an object by examining the forces applied to it 2. Use mathematical expressions to describe the movement of an object 3. Develop and design a scientific investigation to collect and analyze speed and acceleration data to determine the net forces acting on a moving object | **Inquiry Questions:**   1. What relationships exists among force, mass, speed, and acceleration? 2. What evidence indicates a force has acted on a system? Is it possible for a force to act on a system without having an effect? |
| **Relevance and Application:**   1. Engineers take forces into account when designing moving objects such as car tires, roller coasters, and rockets. 2. Vehicles and their propulsion systems are designed by analyzing the forces that act on the vehicle. For example, the designs of propellers and jet engines are based on the aerodynamics of airplanes. |
| **Nature of Science:**   1. Recognize that our current understanding of forces has developed over centuries of studies by many scientists, and that we will continue to refine our understanding of forces through continued scientific investigations and advances in data collection. 2. Find, evaluate, and select appropriate information from reference books, journals, magazines, online references, and databases to answer scientific questions about motion and acceleration. |

Plus: Safety & The Scientific Process, Equipment/Technology (2 weeks)

**2nd Quarter 8th grade 2010-2011**

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| Concepts and skills students master:   * 2. There are different forms of energy, and those forms of energy can be changed from one form to another – but total energy is conserved | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Gather, analyze, and interpret data to describe the different forms of energy and energy transfer 2. Develop a research-based analysis of different forms of energy and energy transfer 3. Use research-based models to describe energy transfer mechanisms, and predict amounts of energy transferred | **Inquiry Questions:**   1. Which forms of energy can be directly observed, and which forms of energy must be inferred? 2. What evidence supports the existence of potential and kinetic energy? 3. Is there a limit to how many times energy can be transferred? Explain your answer. |
| **Relevance and Application:**   1. Photos and measurements of accident investigation provide evidence of energy transfers during such events. 2. Kinetic energy often is turned into heat such as when brakes are applied to a vehicle or when space vehicles re-enter Earth’s atmosphere. 3. Energy transfers convert electricity to light, heat, or kinetic energy in motors. 4. There are ways of producing electricity using both nonrenewable resources such as such as coal or natural gas and renewable sources such as hydroelectricity or solar, wind, and nuclear power |
| **Nature of Science:**   1. Share experimental data, and respectfully discuss conflicting results. 2. Recognize and describe the ethical traditions of science: value peer review; truthful reporting of methods and outcomes; making work public; and sharing a lens of professional skepticism when reviewing the work of others. 3. Use tools to gather, view, analyze, and report results for scientific investigations designed to answer questions about energy transformations. |

**2nd Quarter 8th grade 2010-2011**

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| Concepts and skills students master:   * 4. Recognize that waves such as electromagnetic, sound, seismic, and water have common characteristics and unique properties | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Compare and contrast different types of waves 2. Describe for various waves the amplitude, frequency, wavelength, and speed 3. Describe the relationship between pitch and frequency in sound 4. Develop and design a scientific investigation regarding absorption, reflection, and refraction of light | **Inquiry Questions:**   1. What are some different ways to describe waves? |
| **Relevance and Application:**   1. Different vibrations create waves with different characteristics. For example, a vibrating low-pitch guitar string feels different to the touch than a high-pitch guitar string. 2. Dealing with different types of waves presents design challenges. For example, higher frequency waves have shorter wavelengths, which affect ships, buildings, and antenna design. 3. Energy from different types of waves can affect the environment. For example, natural waves cause different beach erosion and boat wakes 4. There are many applications of light and lasers such as using fiber optics in high speed communication and lasers in surgery. 5. Living organisms collect and use light and sound waves – such as for hearing and vision – to gather information about their surroundings |
| **Nature of Science:**   1. Evaluate models used to explain and predict wave phenomena that cannot be directly measured. 2. Understand that scientists work from the assumption that the universe is a single system in which the basic rules are the same everywhere. For example, the speed of light in a vacuum is constant across space and time. 3. Select and use technology tools to gather, view, analyze, and report results for scientific investigations about the characteristics and properties of waves. |

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| Concepts and skills students master:   * 3. Distinguish between physical and chemical changes, noting that mass is conserved during any change | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Identify the distinguishing characteristics between a chemical and a physical change 2. Gather, analyze, and interpret data on physical and chemical changes 3. Gather, analyze, and interpret data that show mass is conserved in a given chemical or physical change 4. Identify evidence that suggests that matter is always conserved in physical and chemical changes 5. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate physical and chemical changes | **Inquiry Questions:**   1. What evidence can indicate whether a change is physical or chemical? 2. Is it easier to observe the conservation of mass in physical or chemical changes? Why? 3. What would happen if mass were not conserved? |
| **Relevance and Application:**   1. The freezing, thawing, and vaporization of Earth’s water provide examples of physical changes. 2. An understanding of chemical changes have resulted in the design various products such as refrigerants in air conditioners and refrigerators. 3. Physical and chemical changes are involved in the collection and refinement of natural resources such as using arsenic in gold mining. 4. Living systems conserve mass when waste products from some organisms are nutrients for others. |
| **Nature of Science:**   1. Evaluate the reproducibility of an experiment, and critically examine conflicts in experimental results. 2. Share experimental data, and respectfully discuss conflicting results emulating the practice of scientists. |

**3rd Quarter 8th grade 2010-2011**

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| Concepts and skills students master:   * 4. The relative positions and motions of Earth, Moon, and Sun can be used to explain observable effects such as seasons, eclipses, and Moon phases | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Develop, communicate, and justify an evidence-based explanation using relative positions of Earth, Moon, and Sun to explain the following natural phenomenon:    1. Tides    2. Eclipses of the Sun and Moon    3. Different shapes of the Moon as viewed from Earth 2. Analyze and interpret data to explain why we have seasons 3. Use models to explain the relative motions of Earth, Moon, and Sun over time | **Inquiry Questions:**   1. Why do we observe changes in the relative positions of Earth, Moon, and Sun from Earth over time? 2. How do the relative positions of Earth, Moon and Sun affect natural phenomenon on Earth? |
| **Relevance and Application:**   1. Different tools are used to help understand motion in the solar system. 2. Space missions can be planned because we understand planetary motion. |
| **Nature of Science:**   1. Explore the global consequences of the interrelationships among science, technology and human activity. 2. Evaluate visual and print media for scientific evidence, bias, and conjecture related to the historical ideas about relative positions of the Earth, Moon and Sun. |

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| Concepts and skills students master:   * 3. The solar system is comprised of various objects that orbit the Sun and are classified based on their characteristics | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Construct a scale model of the solar system, and use it to explain the motion of objects in the system such a planets, Sun, Moons, asteroids, comets, and dwarf planets 2. Describe methods and equipment used to explore the solar system and beyond 3. Design an investigation that involves direct observation of objects in the sky, and analyze and explain results 4. Research, critique, and communicate scientific theories that explain how the solar system was formed 5. Use computer data sets and simulations to explore objects in the solar system 6. Recognize that mathematical models are used to predict orbital paths and events | **Inquiry Questions:**   1. How are the various bodies in the solar system similar and different? 2. How does investigating characteristics of the various bodies in the solar system provide clues to Earth’s origin and evolution? 3. Why do objects such as satellites, Moons and planets stay in orbit? 4. How is the life cycle of a star such as the Sun similar to the cycle of life on Earth? |
| **Relevance and Application:**   1. Various technological methods and equipment such as telescopes are used to investigate far-away objects in the solar system and beyond. 2. By representing galaxies and solar systems, planetariums allow people to simulate the experience of outer space. |
| **Nature of Science:**   1. Understand that scientists work from the assumption that the universe is a single system in which the basic rules are the same everywhere – that planets follow the same rules about forces as other objects.   Recognize that our current understanding of the solar system has developed over centuries of studies by many scientists, and that through continued scientific investigations and advances in data collection, we will continue to refine our understanding of the solar system. |

**4th Quarter 8th grade 2010-2011**

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| Concepts and skills students master:   * 1. Weather is a result of complex interactions of Earth's atmosphere, land and water, that are driven by energy from the sun, and can be predicted and described through complex models | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Differentiate between basic and severe weather conditions, and develop an appropriate action plan for personal safety and the safety of others 2. Observe and gather data for various weather conditions and compare to historical data for that date and location 3. Use models to develop and communicate a weather prediction | **Inquiry Questions:**   1. Why does weather vary from day to day? 2. What are the strengths and limitations of different types of weather models? 3. What are the variables that make predicting weather challenging? 4. How do weather patterns relate to climate? |
| **Relevance and Application:**   1. Weather stations, buoys, satellites, radar, and computer modeling are examples of technology used to help forecast weather. 2. Weather prediction is based on the interaction of many variables. 3. Weather prediction can save lives, protect property, and conserve resources. |
| **Nature of Science:**   1. Evaluate of the accuracy of various tools used in forecasting weather. 2. Use the historical context and impact of early weather research and consider the potential implications for current weather studies on science and our society. |
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| Concepts and skills students master:   * 2. Earth has a variety of climates defined by average temperature, precipitation, humidity, air pressure, and wind that have changed over time in a particular location | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Develop, communicate and justify an evidence-based scientific explanation to account for Earth’s different climates 2. Research and evaluate direct and indirect evidence to explain how climates vary from one location to another on Earth 3. Examine, evaluate, and question information from a variety of sources and media to investigate how climates vary from one location to another on Earth | **Inquiry Questions:**   1. How does the climate in one area compare and contrast with another area? 2. Why are there different climates on Earth? 3. How has Earth’s climate changed over time? 4. What evidence supports and/or contradicts human influence on climate change? 5. What is the difference between weather and climate? |
| **Relevance and Application:**   1. Data tables, charts, and graphs allow people to compare and contrast various climates around the globe. 2. Computer models help people understand past, present, and future climates. |
| **Nature of Science:**   1. Ask testable questions and make a falsifiable hypothesis about earth’s climate and use an inquiry based approach to find an answer. 2. Describe various techniques that scientists use to study climate, and suggest ways that each technique can be used to better understand various climates and changes in climate |

**4th Quarter 8th grade 2010-2011**

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| Concepts and skills students master:   * 1. Human activities can deliberately or inadvertently alter ecosystems and their resiliency | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Develop, communicate, and justify an evidence-based scientific example of how humans can alter ecosystems 2. Analyze and interpret data about human impact on local ecosystems 3. Recognize and infer bias in print and digital resources while researching an environmental issue 4. Use technology resources such as online encyclopedias, online databases, and credible websites to locate, organize, analyze, evaluate, and synthesize information about human impact on local ecosystems 5. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate an environmental issue | **Inquiry Questions:**   1. Do humans have a unique responsibility to the ecosystems in which they live? 2. How can a young person be a steward of an ecosystem? |
| **Relevance and Application:**   1. Human activities such as cutting down forests and polluting water or covering deserts with fields of solar panels are constantly changing various cycles and habitats in the natural world. 2. There are laws that preserve and protect wilderness areas such as national parks and other natural areas but such laws also limit the utilization of the natural resources in those areas. |
| **Nature of Science:**   1. Critically evaluate scientific claims in popular media and peer generated explanations regarding interactions in ecosystems, and determine if the evidence presented is appropriate and sufficient to support the claims. |

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| Concepts and skills students master:   * 2. Organisms reproduce and transmit genetic information (genes) to offspring, which influences individuals’ traits in the next generation | |
| **Evidence Outcomes**  **Students can:** | **21st Century Skills and Readiness Competencies** |
| 1. Develop, communicate, and justify an evidence-based scientific explanation for how genetic information is passed to the next generation 2. Use direct and indirect observations, evidence, and data to support claims about genetic reproduction and traits of individuals 3. Gather, analyze, and interpret data on transmitting genetic information 4. Use models and diagrams to predict the phenotype and genotype of offspring based on the genotype of the parents 5. Use computer simulations to model and predict phenotype and genotype of offspring based on the genotype of the parents | **Inquiry Questions:**   1. How are traits passed from one generation to the next? 2. What traits can be passed to the next generation and what traits cannot? 3. How can patterns in the inheritance of traits be used to predict how frequently they appear in offspring? |
| **Relevance and Application:**   1. There are benefits and risks to genetic engineering such as cloning, genetically modifying organisms, and replacing genes for therapy. 2. Genome sequencing has many potential applications to the field of medicine. |
| **Nature of Science:**   1. Understand the interconnected nature of math and science by utilizing math in the prediction of future generations. 2. Recognize that current understanding of genetics has developed over time and become more sophisticated as new technologies have lead to new evidence. 3. Critically evaluate models used to represent deoxyribonucleic acid (DNA) and genes; identify strengths and weaknesses of these models for representing complex natural phenomena. |

Plus: Health (1 week)